WORKPIECE BEVELING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to a beveling machine which is designed to cut a bevel of uniform dimensions along one or both edges of a workpiece, such as a floor strip with tongue and groove edges.

Such flooring strips are not always of uniform straightness, thickness, and width, and when the individual strips are formed into a finished floor, there can be raised edges which can catch the heel of a person walking on the surface. To alleviate this problem, it has been conventional to cut a small bevel along each upper edge of the flooring strips, utilizing a cutting wheel which is mounted along each side of a conveyor which serially advances the flooring strips past the cutting wheels. However, this prior practice is not entirely satisfactory since the non-uniformity of the flooring strips results in a non-uniform bevel.

It is accordingly an object of the present invention to provide a beveling machine which is adapted to cut a bevel along one or both edges of a workpiece as the workpiece is advanced along a linear path of travel, and wherein the bevel is of uniform dimensions along the edge of the workpiece.

SUMMARY OF THE INVENTION

The above and other objects and advantages of the invention are achieved by the provision of a beveling apparatus which comprises a motor assembly which includes a cutting wheel, and means mounting the motor assembly adjacent the path of travel of the workpiece as it is advanced along the path of travel by a conveyor, with the

cutting wheel contacting the edge of the advancing workpiece. Also, the motor assembly is mounted to permit floating movement of the motor assembly in a direction toward and away from the edge of the workpiece as the workpiece is advanced along the path of travel.

A guide shoe is fixed to the motor assembly and positioned to ride on the advancing workpiece and so that the guide shoe and the cutting wheel follow the contour of the edge of the advancing workpiece and thereby cause a uniform bevel to be formed along the edge of the advancing workpiece.

In a preferred embodiment, the cutting wheel of the motor assembly is mounted to a rotatable draft shaft which extends in a horizontal direction which is substantially perpendicular to the path of travel of the workpiece, and the motor assembly is configured to permit separate floating movement in two directions, namely an in and out first direction which is parallel to the axis of the drive shaft and in an up and down or vertical second direction. Also, a manual adjustment of the motor assembly toward and away from the workpiece along the first direction is possible, and a separate manual adjustment of the motor assembly up and down along the second direction is also possible.

Also in a preferred embodiment, the invention comprises a second beveling apparatus which is configured to correspond to the structure and function of the above described beveling apparatus, and which is positioned on the side of the workpiece conveyor opposite the side on which the above described beveling apparatus is positioned. This permits the opposite edges of the workpieces to be concurrently beveled as they are

serially advanced by the conveyor along the path of travel.

BRIEF DESCRIPTION OF THE DRAWINGS

Some of the objects and advantages of the present invention having been stated, others will appear as the description proceeds when considered in conjunction with the accompanying drawings, in which

Fig. 1 is a perspective view of a workpiece beveling apparatus which embodies the present invention;

Fig. 1A is an end view of a workpiece after being processed by the apparatus of the invention;

Fig. 2 is a top plan view of the apparatus;

Fig. 3 is a side elevation view of the apparatus;

Fig. 4 is a rear elevation view of the apparatus;

Fig. 5 is a transverse sectional view taken along the line 5-5 of Fig. 2;

Fig. 6 is a perspective view of the underside of the hold down guide shoe as used with the apparatus of the invention;

Fig. 7 is a perspective view of one of the slide assemblies of the apparatus of the invention;

Fig. 8 is a somewhat enlarged sectional view taken along the line 8-8 of Fig. 7; and

Fig. 9 is a horizontal sectional view taken along the line 9-9 of Fig. 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring more particularly to the drawings, a workpiece beveling apparatus **10** is illustrated which is positioned on one side of a conveyor **12** for serially advancing the workpieces **W**, which in this case are flooring strips having tongue and groove edges, along a

horizontal linear path of travel. The conveyor **12** is conventional and is composed of a segmented belt **13** with hold down rollers **14**, note Fig. 4.

The apparatus **10** is designed to cut a bevel **B** along one top edge of the advancing flooring strips as best seen in Fig. 1A, and when two apparatuses **10** and **10'** are utilized as further described below, a bevel may be simultaneously cut along both top edges.

The apparatus **10** comprises a motor assembly **16** mounted on a fixed frame **17** on one side of the conveyor **12**, and the motor assembly **16** includes a horizontal support plate **18** which mounts an electric motor **19**. The electric motor **19** has a drive shaft **20** which extends in a generally horizontal direction which is perpendicular to the path of travel defined by the conveyor **12**. A conventional cutting wheel **22** is mounted on the end of the drive shaft **20** so as to rotate in a plane which is generally vertical and parallel to the path of travel. Also, the cutting wheel **22** is mounted so as to contact the upper edge of the advancing workpieces **W** and cut a bevel **B**, as further described below.

The motor assembly **16** is mounted by a mounting arrangement which includes a first linear slide assembly **24** which permits manual adjustment of the motor assembly **16** toward and away from the path of travel along a first direction which is substantially parallel to the axis of the drive shaft **20**. The first linear slide assembly **24** also permits the motor assembly **16** to float against spring biasing forces a limited distance toward and away from the workpiece along the first direction, in a manner further described below.

The mounting arrangement of the motor assembly **16** also includes second and third linear slide assemblies

25, 26 which are connected to each other in parallel, and which permit manual adjustment in an up and down or second vertical direction. The second and third linear slide assemblies **25, 26** also permit the motor assembly **16** to float against spring biasing forces a limited distance up and down along the second direction, as described in detail below.

The second and third linear slide assemblies **25, 26** are of like construction, and only the second assembly **25** will be described herein with reference to Figs. 7-9. The second and third slide assemblies **25, 26** are disposed in a mirror image relationship on opposite sides of the motor assembly **16** and on opposite sides of the first slide assembly **24**.

As illustrated in Figs. 7-9, the second slide assembly **25** comprises a C-shaped frame member **28** which is fixed to the main frame **17** of the apparatus and which is composed of a vertical back plate **29** and upper and lower horizontal end plates **30, 31** respectively. An adjusting hand wheel **32** and screw **33** are provided, with the wheel being mounted to extend vertically between the end plates **30, 31** so as to permit free rotation while being held against axial movement.

The second slide assembly **25** further includes a vertically disposed guide rail **35** which is fixed between the end plates **30, 31**, and a micrometer **37** is mounted to the end plate **30** for the purpose of accurately sensing the rotational position of the screw **33** and thus the hand wheel **32**. The micrometer **37** thus visually indicates the height of the cutter relative to the workpiece.

The second slide assembly **25** mounts an adjustable slide housing **39** which is mounted for vertical movement along the rail **35** and the screw **33**. The slide housing **39**

is composed of a box-like rectangular frame which consists of two opposite side plates **41, 42** and top and bottom plates **43, 44**. The screw **33** threadedly engages one or both of the top and bottom plates **43, 44**, so that upon rotation of the screw the frame of the slide housing **39** moves up or down along the rail **35**.

Within the slide housing **39** there is mounted a slide **46** which includes a guide plate **47** which directly engages the rail **35** via suitable bearings, so that the slide **46** is free to move up and down along the rail. The slide also has a mounting plate **48** which is fixed to the guide plate **47** as best seen in Fig. 9. As also seen in Fig. 9, the screw **33** extends freely through a vertical bore **49** in the mounting plate.

Two positioning spring assembles **51, 52** are mounted in the top plate **43** and engage the upper end of the mounting plate **48**, and two positioning spring assemblies **53, 54** are mounted in the bottom plate **44** and engage the lower end of the mounting plate **48**. The four spring assemblies are of like construction and each includes a plunger **55** which is axially biased outwardly by an internal spring **56**. The force of the spring acting on the plunger is controlled by a cap screw **57** which may be engaged and rotated by a suitable tool **T** which extends through an opening in the top or bottom plate as illustrated in Fig. 8.

As will be apparent, the mounting plate **48** of each slide **46** is held between the spring assemblies **51-54** so as to permit a limited floating movement against a spring biasing force in both the up and down directions.

The mounting plate **48** of each slide assembly **25, 26** is fixed to an inverted U-shaped bracket **60**, which in turn supports the first linear slide assembly **24**

thereupon, note Fig. 4. The first linear slide assembly is of a construction corresponding to the above described second and third assemblies, but it is disposed in a horizontal orientation. Also, the mounting plate **48** of the first slide assembly **24** is fixed to the support plate **18** of the motor assembly **16**, so that the motor assembly **16** is mounted to permit manual adjustment and floating movement in the manner described above with respect to the second assembly **25**.

In the case of the second and third linear slide assemblies **25**, **26**, it will be seen from Fig. 4 that the two screws **33** are rotatably interconnected by a chain and sprocket drive **62**, so that the two screws always rotate in unison. As will become apparent, this permits adjustment in the up and down direction from either side of the motor assembly **16**. Thus the operator may be located on either side of the motor assembly and may turn either one of the hand wheels **32** to effect the desired adjustment.

From the above, it will be seen that rotation of the hand wheel of either of the second and third slide assemblies **25**, **26** causes both slide housings **39** and thus the motor assembly **16** to move up or down, and the positioning of the slide housing and motor assembly may thereby be manually adjusted in the vertical direction. The back plate **29** of the second slide assembly **25** may have a scale printed thereon to facilitate the placement of the motor assembly at a desired elevation, note Figs. 4 and 7. Also, the slide housings **39** and motor assembly **16** can then float a limited distance in both vertical directions from the adjusted setting.

Similarly, rotation of the hand wheel of the first slide assembly **24** causes the slide housing **39** and the

motor assembly **16** to move in and out along a direction parallel to the axis of the drive shaft **20**, and a scale may be printed on the back plate to indicate its position, note Fig. 3. Once the manual adjustment is completed, the motor assembly can then float a limited distance in the in and out directions from the manual setting.

The edge of the support plate **18** of the motor assembly which is adjacent the conveyor **12** mounts a guide shoe **65** which is positioned to engage and ride on each advancing workpiece. The guide shoe **65** includes a horizontal, downwardly facing first contact surface **66** which is positioned to engage the top surface of the workpiece, and a vertical second contact surface **67** which is positioned to engage the side edge of each advancing workpiece. The second guide surface **67** is substantially aligned with and axially inside of the plane of the cutting wheel **22**, and the first guide surface **66** is positioned on a bar **68** which is axially beyond the plane defined by the cutting wheel.

The guide shoe **65** is mounted to the support plate **18** of the motor assembly **16** so that the cutting wheel is located in the opening formed between the outer bar **68** and the main body of the guide shoe, and so as to permit manual adjustment of the guide shoe toward and away from the cutting wheel in a direction which is substantially parallel to the axis of the rotatable drive shaft **20**. This mounting arrangement includes a pair of parallel threaded members **70** which are mounted on the support plate **18** for free rotation and which are threadedly joined to the rear sides of the shoe **65**, note Fig. 2. Thus rotation of the two threaded members **70** causes the

shoe **65** to move in and out with respect to the workpieces **W**.

As part of the machine set-up, the operator initially adjusts the positioning of the guide shoe **65** on the support plate **18** so as to properly engage the particular workpieces **W** to be beveled. Next, the operator adjusts the hand wheel **32** of the first linear slide assembly **24** to set the cutting wheel **22** at the proper position in the in and out direction with respect to the size of the workpieces, and the operator also adjusts the hand wheel of the closest of the second and third linear slide assemblies **25**, **26** to set the cutting wheel **22** at the proper position in the up and down direction.

The conveyor **12** and the motor **19** are then activated, so that the workpieces **W** are serially conveyed along a horizontal path of travel past the rotating cutting wheel **22**. The second contact surface **67** of the guide shoe rides on the adjacent edge of each workpiece (note Fig. 3), and in the event of a variation in the width of the workpiece, the shoe **65** follows the contour and causes the motor assembly **16** to float so that its position relative to the changing contour is maintained.

The first contact surface **66** of the guide shoe **65** rides on the top of each workpiece (note Fig. 5), causing the motor assembly **16** to float up and down with the changing thickness of the workpiece. Thus the cutting wheel **22** closely follows the contour in both directions, resulting in a uniform dimension of the bevel **B** being cut.

As schematically illustrated in Figs. 1-3, the apparatus of the invention may incorporate a second beveling apparatus **10'** which is of a construction

substantially identical to that described above. The use of a second beveling apparatus permits the opposite edges of the workpieces **W** to be concurrently beveled as they are advanced along the conveyor.

Many modifications and other embodiments of the invention set forth herein will come to mind to one skilled in the art to which this invention pertains having the benefit of the teachings presented in the foregoing description and the associated drawings. For example, the apparatus **10** as specifically illustrated herein is configured to move and float in two directions, i.e. in and out and up and down, but the apparatus could be configured to move and float in a single direction, e.g. in a direction perpendicular to the beveled surface being formed on the workpieces. Therefore, it is to be understood that the invention is not to be limited to the specific embodiment disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.